

The Cost of a House versus the Cost of Housing: Evaluating Different Approaches to Measuring Owned- Accommodation in the Canadian CPI

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I. Introduction

The Consumer Price Index (CPI) is one of the most widely used measures of inflation. It dominates most media and economists' comments on the inflation outlook. One reason for this pre-eminence is that the CPI is meticulously calculated following international standards and methods. The prices of about 1200 unique products and services across the country are collected on a monthly basis¹. These collected prices are used to calculate price indices and produce the CPI according to international standards and methodologies, which are regularly updated and reviewed by price statistics experts. Although there are several internationally recognized approaches to the treatment of housing, there is no international consensus on how price change for owned accommodation should be measured in the CPI.

Owned accommodation (OA) accounts for more than half of the shelter expenditures in Canada, an important component in most people's household budgets. Expenditure weights and price movements of the owned accommodation component in the CPI are critically dependent on the choice of the approach for measuring owned accommodation.

There are different approaches² for estimating OA in the CPI. It can be implicitly calculated by estimating the rental payments of the owner-occupiers (rental equivalence), or explicitly by total actual housing costs, using the payment approach. This could also be done using the acquisition approach that measures the cost paid by a household to acquire a house. Another option is the user cost approach, which covers conceived costs of house ownership.

In addition, the treatment of OA is an integral part of the discussion over how to explain the gap between perceived and measured inflation. In fact, when households think about the cost of housing, they likely think about how much it costs to buy a house (price of a house) and not how much it costs to own a house (cost of housing). The difference between the price of a house and the cost of owning a house can be a source of confusion, and affects consumers' perception of inflation, potentially widening the inflation perception-measurement gap. In addition, it has a significant impact on the credibility of CPI as the official measure of inflation. Hence, there are two main questions we would like to address. First, is the public confusion between the cost of a house and the cost of housing one contributing factor to the perception-measurement inflation gap? Second, how should owned accommodation be measured in CPI? Should the CPI reflect the change in the cost of a house or that of the cost of housing and what factors should be considered in this decision?

¹ Some goods and services are sampled on an intermittent basis (quarterly, semi-annual, etc).

² We exclude the option of **Excluding Owned Accommodation from CPI**: Conceptually, an owner-occupied dwelling can be considered as an investment or as a consumption good, or both. Hence, one option is to consider owned accommodation as a pure investment and therefore exclude from the CPI any effect of price change related to the purchase and use of an owned accommodation.

In the following section of this paper, we will review the different approaches of estimating the OA and present their impact on all items-CPI. We will then assess them using several criteria. Hence, we will examine the approach purpose. An evaluation of practical considerations and data limitation related to the calculation of the OA component indexes and weights, will also be presented. Implications for monetary policy will be discussed. Finally, we will assess the impact of the different approaches on the perception-measurement gap.

II. Alternative Approaches for Cost of Owned Accommodation (OA)

In a market economy, there is relatively little difficulty in measuring the price of housing services, which is given by the rent that a landlord charges for providing accommodation. A rise in average rent represents (keeping the same quality of the provided services) a rise in the price of accommodation services.

The problem starts when the landlord and occupier are the same person: there is consumption of housing services but no measurable rent. How statistical agencies should treat the owned accommodation in their CPI is a complex and difficult question. The price of owned accommodation services is difficult to identify and measure. Because of the relative importance of owned accommodation services in the CPI, each used approach has a different impact on the change of all-items CPI.

Approach I: Acquisition Approach

In this approach, owned accommodation services are considered a consumption good, this category of services is treated similarly to other durables in the CPI. That is, CPI will attribute all expenditure on housing purchase to the period of purchase, even though the use of the purchased house extends beyond that period. The expenditure weight for the owned accommodation component in the CPI basket corresponds to the net acquisitions of dwellings in the reference year of the basket; owned accommodation transactions between households are excluded from the expenditure weight.

Intuitively the value of the net acquisitions should cancel out to almost nil. The positive value of net acquisition can be explained by the construction of new units that have been added to the market during the year and withdrawn of units because of demolition, natural events, or other reasons. It represents the net purchases of the household sector of houses from other institutional sectors. Thus, they may also cover purchases of second-hand dwellings from other sectors (Canadian municipalities or other organizations may sell rental dwellings to owner occupiers) and converted buildings to residential dwellings. In addition, the net acquisition³ includes major renovations and additions to owner-occupied dwelling units.

³ The expenditure weights of net acquisition is calculated as the difference between purchase price of the home bought and selling price of the home sold (net home purchase of principal dwellings) in the survey year. However,

Dion and Sabourin (2011) provide a detailed evaluation and analysis of owned accommodation approaches and the variety of CPI users' needs and requirements. They find that the acquisition approach has an interesting characteristic for the purpose of measuring price inflation for monitoring central bank monetary policy, because it encompasses instantly the effect of housing price increase in the CPI. However, the acquisition approach is not consistent with the purpose of CPI as an escalator for nominal income (cost of living indexing), because it does not take into account the flows of service that are generated by owned accommodation.

Approach II: Rental Equivalence

A second approach is to account for the shelter services that are generated by an owned accommodation, as if the homeowner rented his dwelling to himself. Since these services' prices are not observable and can't be determined on the basis of a market transaction, we may impute the price movement from another series, such as the rent series or through the conduct of a separate owner' rental equivalence survey. In this rental equivalence approach, the owned accommodation expenditure weight in the CPI basket is based on the estimated rental expenditure by homeowners.

The advantage of this approach is that housing services obtained from owned accommodation dwellings are treated similarly with shelter services obtained in the rented accommodation market, i.e. whether the house occupier is a tenant or a homeowner does not prevent statisticians from comparing their aggregate accommodation expenditures across households.

The rental equivalence approach is suitable for cost-of-living indexing, as it relies on estimates of the prices of current consumption of accommodation services. However, because of the absence of a direct housing price effect on its measure, the rental equivalence index has a limited use for monetary policy (Dion and Sabourin, 2011). Still, there is an indirect effect of changes in housing price on the rental equivalence owned accommodation prices. This occurs since they are imputed from tenants' rental prices or closely tied to them, which are affected, at least in the long term, by the housing price changes. Nevertheless, it is important to mention that because of provincial and municipal regulations and interventions in the local rental markets, the direct effect of housing price on rental equivalent index is limited; hence rental control makes the house price to rent ratio not stationary around any steady state, at least in the short term.

Approach III: Statistics Canada's OA Approach⁴

The official Canadian CPI is designed to be an indicator of the changes in consumer prices experienced by Canadians, and the treatment of owned accommodation is determined according to this concept. Hence, as the rented accommodation index is designed to detect the impact of

typically, the net purchases of existing dwellings are usually unimportant, and purchases of new owner occupied dwellings closely approximate the net acquisition expenditure weights.

⁴ Considered as variant of the user cost approach

price changes on tenants' specific cost of shelter, the owned accommodation index is also designed to detect the impact of price changes on homeowners' specific cost.

The CPI measures the impact of price changes on the cost of a fixed basket of commodities. Similarly, in the Canadian CPI, the owned accommodation index measures the impact of price changes on the cost of using a fixed stock of dwellings. Thus, it relies on measuring the owned shelter services by accounting for homeowners' specific costs, and is consistent with a cost-of-living index concept.

Homeowners' specific cost of shelter in the Canadian CPI includes the following components:

- Replacement cost or depreciation cost⁵
- Mortgage interest cost
- Property taxes
- The cost of homeowners' insurance
- The cost of homeowners' maintenance and repair

Changes in the housing prices affect all the components of homeowners' specific costs. Hence, they affect directly the mortgage interest cost⁶ and replacement cost^{7,8}, as the housing price is part of the calculation of both component price indexes. Housing prices affect indirectly the property taxes through the change of the property assessment values, and homeowner insurance through the change of the value of the replacement cost of houses. Dion and Sabourin (2011) find this approach to be a good compromise between the monetary policy purpose and the escalation purpose of the CPI, in the context of a low inflation regime.

Approach IV: Payment Approach

This approach assumes that owned accommodation services are equivalent to the actual payments made by homeowners such as mortgage payments and other operating expenditures. Imputed costs are excluded by definition, as are other costs which are considered to be investment costs.

Almost all components of Statistics Canada's owned accommodation approach can be considered as cash payments, and would be in scope under the payment approach. These items

⁵ This is the amount of owned accommodation that is assumed to be used up.

⁶ Mortgage Interest Cost Index (MICI) is calculated as the product of two sub-indices: Interest sub-index, which measures the effect of changes in the interest rate on mortgage interest payments, holding the principal outstanding constant. And House sub-index, which measures the effect of changes in house prices on the initial amount of mortgage debt and thus the principal outstanding in subsequent periods, holding interest rates constant.

⁷ Dion and Sabourin (2011) find mortgage interest cost and replacement cost significantly sensitive at medium term to housing price movements.

⁸ For the replacement cost, the price index is derived by taking the total value of homes owned in Canada at the end of the basket reference year and adjusting the total each month by changes in house prices as reflected by the New Housing Price Index, excluding land.

are mortgage interest cost, property taxes, homeowners' insurance premium, homeowners' maintenance and repair, and other owned accommodation expenses. The only exception is replacement cost, which represents essential expenditures required to restore lost value of the owned accommodation due to "obsolescence". It is considered to be an imputed item, and is excluded from the owned accommodation cost under the payment approach.

Some economists argue that the payment approach is appropriate for CPI's primary use as an escalator for nominal income; however, Dion and Sabourin (2011) find it not consistent with the use of the CPI for monetary policy purposes. Dion and Sabourin (2011) argue that the payment approach is not fully consistent with cost-of-living indexing since it ignores replacement cost. It is also less than desirable from a monetary policy standpoint because it gives a prominent role to mortgage interest cost (and possibly mortgage repayments), a component that is volatile and may send a misleading signal about the stance of monetary policy.

Approach V: User Cost Approach

The user cost approach is derived from the capital theory that assumes the user cost is an estimation of the rental price based on the costs of owning a house. User cost encompasses actual and imputed costs for owned accommodation. Hence, an owner would incur interest costs during the period of ownership (actual interest costs on mortgages and/or forgone rate of return on owned funds which could otherwise have earned interest), a replacement cost, and other operating costs (such as maintenance and repairs fees, property taxes and insurance premiums). Offsetting these expenses would be an expected capital gain (the expected selling price at the end of the year less the purchase price).

We use the simplified user cost⁹ method, defined as follows:

$$u_t = r_t + \delta_t + \omega_t - g_t$$

u_t is per dollar user cost

r_t is the real interest rate

δ_t is the depreciation rate

ω_t is the running and average transaction costs (including taxes)

g_t is the real capital gain on housing

We estimate five variants¹⁰ of the user cost approach.

a) **Simple user cost:** where \bar{r}_t and \bar{g}_t are fixed, set equal to 2.5 percent. We assume 2.5 per cent, as the average long run natural rate of interest, representing the real rate of interest that would equate saving and investment in full employment. In fact, based on Kichian

⁹ Robert J. Hill et al 2020. "Owner Occupied Housing, Inflation and Monetary Policy." Graz Economics Papers

¹⁰ For all variants we used the official estimations of δ_t and ω_t (depreciation/ replacement cost and other transaction costs). For more details on these components see the Canadian CPI reference paper.

study¹¹, she estimates that in equilibrium real interest rate is between the values of 2.4 and 2.7 percent, for the period 1999-2005 in Canada.

- b) r_t and g_t are variables, where r_t is the average real interest rate, calculated as (30% of Government of Canada marketable bonds 10 years, average yields + 70% of mortgage interest rate) minus expected inflation rate 1.9% (average annual inflation rate over the 2001-2021 period). We estimated different user cost variants applying different values for real capital gain :
- User cost (0)**: where the real capital gain is null: $g = 0$
 - User cost (10), User cost (25), and User cost (30)** where real capital gains are respectively the geometric mean of the 10 years, 25 years and 30 years real capital gains, $g(10)$, $g(25)$, and $g(30)$

There are a number of questions with this approach. The first is whether it is right to capture the increase in wealth that occurs when house prices rise via a price index. It seems reasonable to assert that people feel better off in a housing boom not because the price of housing services has fallen, but because their comprehensive income (earnings plus capital gains) has risen. It seems odd to try and capture this increase in wealth statistically via a fall in a price index.

The second question is whether this approach overstates the extent to which people are made better off by a housing boom. The formula implicitly treats the increase in wealth due to a rise in value of a house exactly on par with the cost of borrowing. But typically interest charges are real cash outs, while the capital gain on the house is a notional increase in wealth which may never be realised.

The User cost approach is consistent with a cost-of-living index. However, there is a negative relationship between an expected housing appreciation and the user cost. That is, in a period of increasing house prices, there is a significant risk of having a negative value of the estimate of market rental price using the user cost approach.

III. Impact of Alternative Approaches on the All-Items CPI

Different pictures emerge in each basket¹², and expenditure share values for the homeowner's specific cost components vary across different approaches, as shown for the 2017 basket in Table 1¹³.

Over time, the expenditure share of owned accommodation based on Statistics Canada's approach, the payment or the rental equivalence approach is less volatile, whereas the user cost

¹¹ Maral Kichian, Identification-Robust Estimates of the Canadian Natural Rate of Interest, *L'Actualité économique, Revue d'analyse économique*, vol. 91, nos 1-2, mars-juin 2015

¹² This study covers the CPI baskets with expenditure reference years 2001, 2005, 2009, 2011, 2013, 2015, and 2017.

¹³ The distributions of the owned accommodation expenditures among its components according to different approaches for the other reference years are available upon request.

and net acquisition approaches lead to a high volatility in the estimates of the owned accommodation's expenditure share (Table 2).

Table 1: Distribution of the owned accommodation expenditures among its components according to different approaches

CPI components (2017 basket)	Statistics Canada' approach	Payment approach	Acquisition approach	Rental equivalence approach	User cost approach
Interest rate of return					27.1%
Mortgage interest cost	20.0%	29.2%	-	-	
Replacement/ depreciation cost	31.4%	-	-	-	35.8%
Property taxes	20.4%	29.8%	22.0%		23.3%
Insurance premiums	8.0%	11.7%	7.6%	1.6%	9.1%
Maintenance and repairs	8.2%	12.0%	8.9%	2.0%	9.4%
Other owned-accommodation expenses	11.9%	17.4%	12.9%	-	13.6%
Equivalent rent	-	-	-	96.4%	-
Home purchase cost	-	-	48.6%	-	-
Capital gain	-	-	-	-	-18.3%

All weights are based on the 2017 Survey of Household Spending except for equivalent rent¹⁴, interest rate of return¹⁵ and capital gain¹⁶.

Table 2: Proportional expenditure weights of Owned Accommodation in the CPI basket according to different approaches and basket reference years

Owned accommodation approach	2013 basket	2015 basket	2017 basket
Statistics Canada's official approach	16.1%	16.1%	16.5%
Payment approach	12.1%	11.9%	11.9%

¹⁴ The rental equivalent expenditure value is based on national account rental equivalent estimates during the reference years.

¹⁵ The expenditure weight of interest rate of return is the product of estimated interest rate and estimated housing value during the reference years.

¹⁶ This is based on the 30 years real capital gains, and estimated as the product of estimated capital gain rate by the estimated housing value during the reference years.

Owned accommodation approach	2013 basket	2015 basket	2017 basket
Acquisition approach	16.5%	12.1%	15.4%
Rental equivalence approach	19.7%	20.2%	20.0%
User cost approach	12.5%	13.1%	14.8%

The year-over-year growth rates and levels of the OA index based on each approach from 2003 to 2020 are plotted in charts 1 to 4. Increased prevalence of rents in CPI leads to weaker inflationary pressures. The rental equivalence series show a significantly lower rate of price change. On average, the rental equivalence approach has the highest owned accommodation expenditure share associated with the lowest rates of price change.

Increased prevalence of house prices in the CPI leads to stronger inflationary pressures. The owned accommodation index series based on the acquisition approach reflect changes in house prices¹⁷ which contribute to their higher rates of price change relative to the official series. Actual payments by homeowners show price pressures similar to the ones based on the official OA index. The payment approach series drops below the index series based on the official approach for most of the estimation period. The inflation rate based on the user cost approach¹⁸ is significantly more volatile than the official measure. All variants of the user cost approach present both volatile owned accommodation expenditure shares and price indexes. CPI series using the user cost approach are more volatile than the official index, reflecting essentially the inconsistent impact of expected capital gain price changes on the owned accommodation estimates.

Hence, different approaches result in a wide range of estimates for the OA price index (chart 5). In term of their impact on inflation, the year-over-year growth rates of all-items CPI series based on the different approaches from 2003 to 2020 are plotted in charts 6 and 7. The payment approach CPI tracks the official CPI fairly closely. The user cost CPI is more volatile than the official CPI, generating volatile inflation rates, reflecting the inconsistent impact of expected capital gain price changes on the OA estimates. The acquisition approach generates the highest inflationary pressures and is much quicker to reflect the inflationary pressure in rising house prices, as opposed to the rental equivalent approach which generates the lowest inflation index.

¹⁷ We estimate different variants of net acquisition approach applying different house price indexes.

¹⁸ We estimate 13 variants of user cost approach applying different house price indexes.

Chart 1: Increased prevalence of rents in CPI leads to weaker inflationary pressures

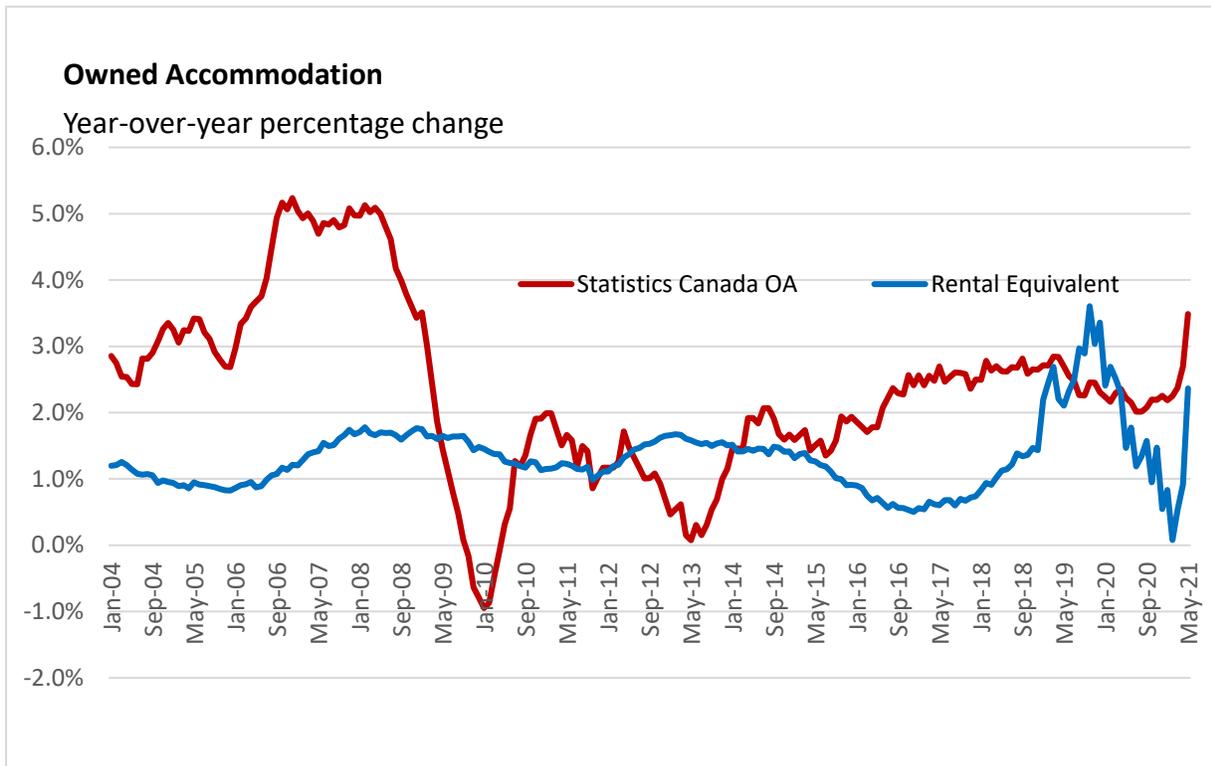


Chart 2: Increased prevalence of house prices in CPI leads to stronger inflationary pressures

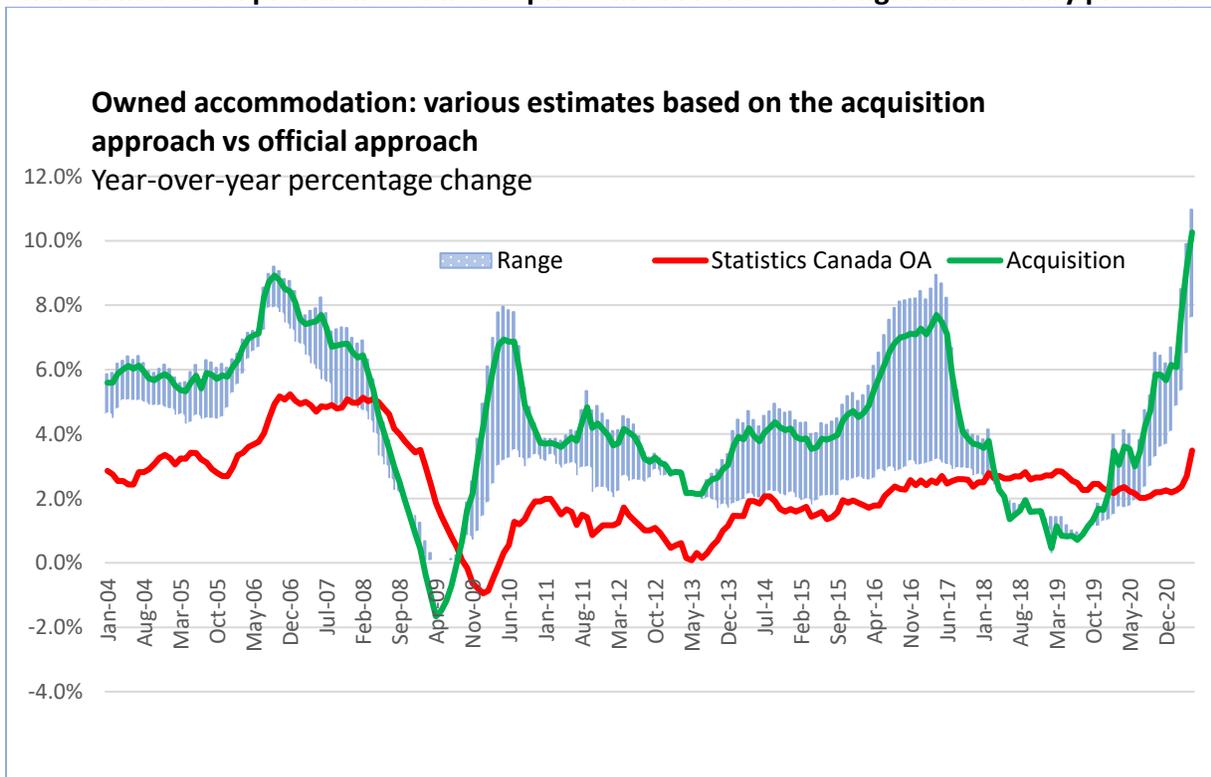


Chart 3: Actual payments by homeowners show price pressures similar to official OA

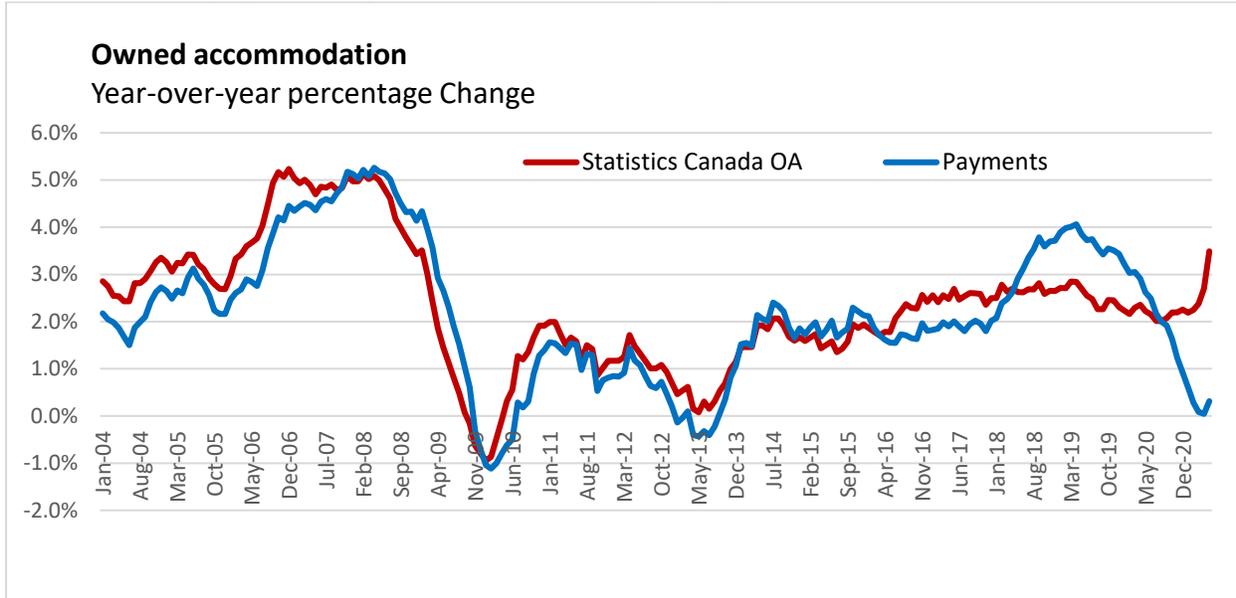


Chart 4: User-cost inflation is significantly more volatile than the official measure

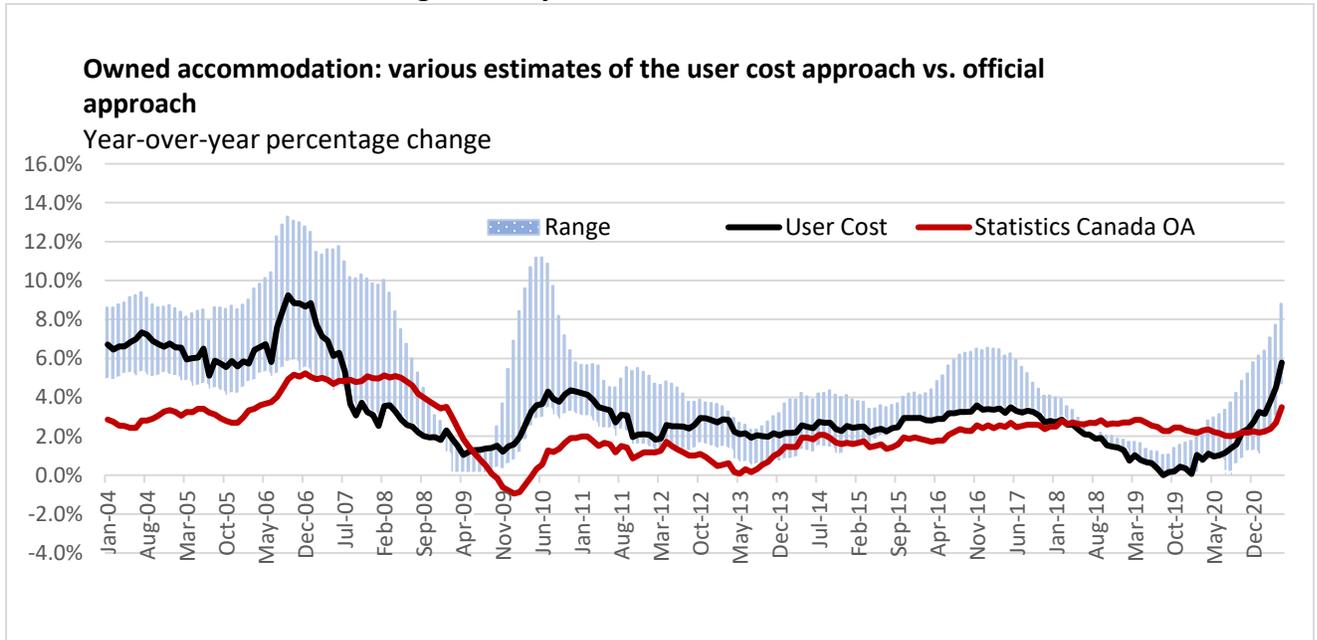


Chart 5: Different approaches give a wide range of estimates for OA

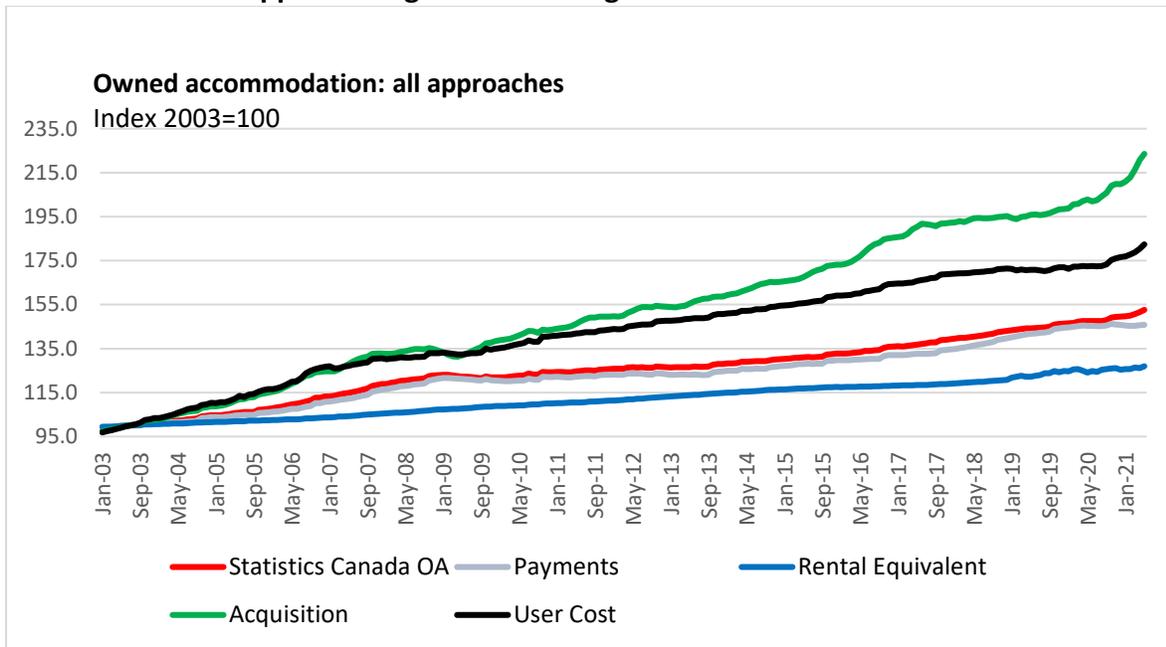


Chart 6: The user cost approach shows a volatile growth rate in the All-items CPI inflation

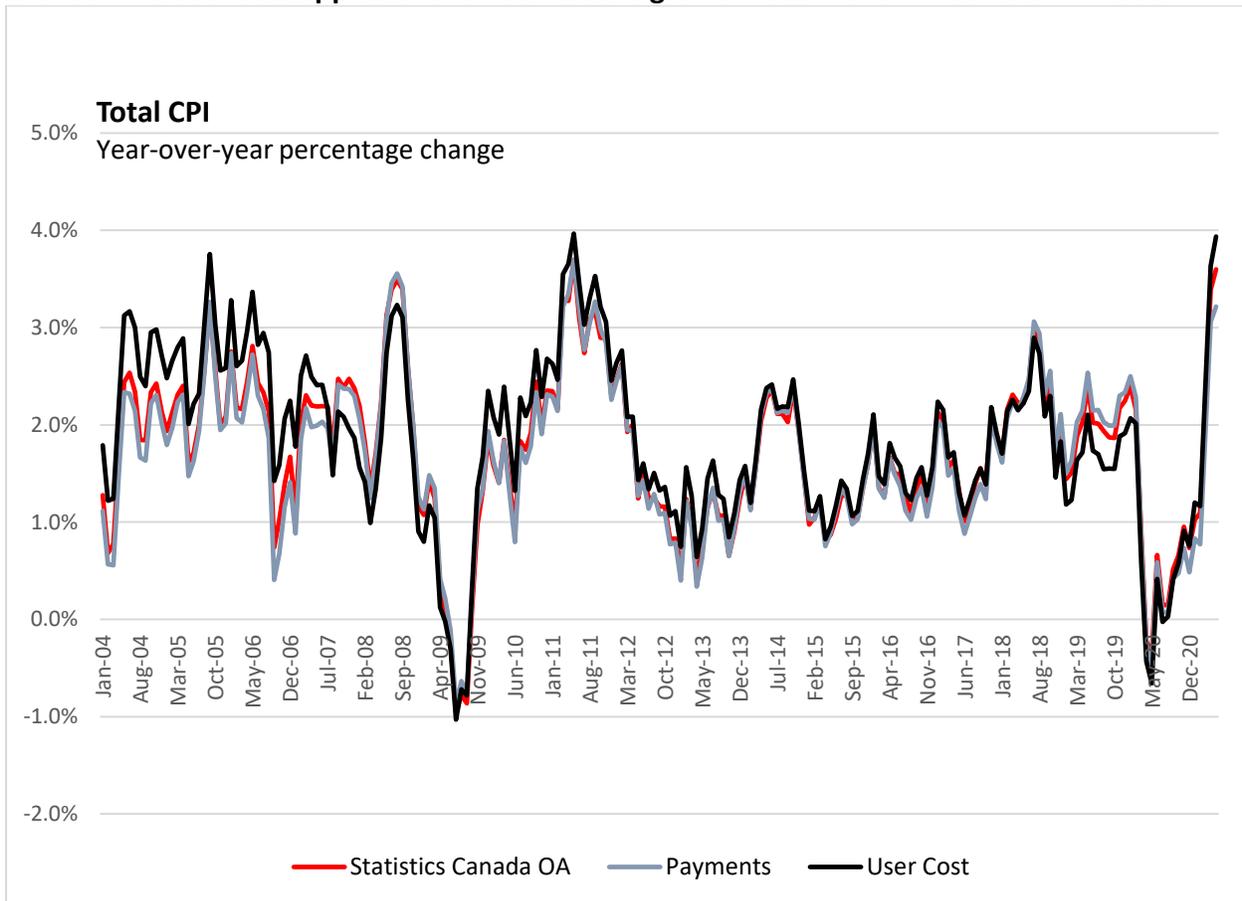
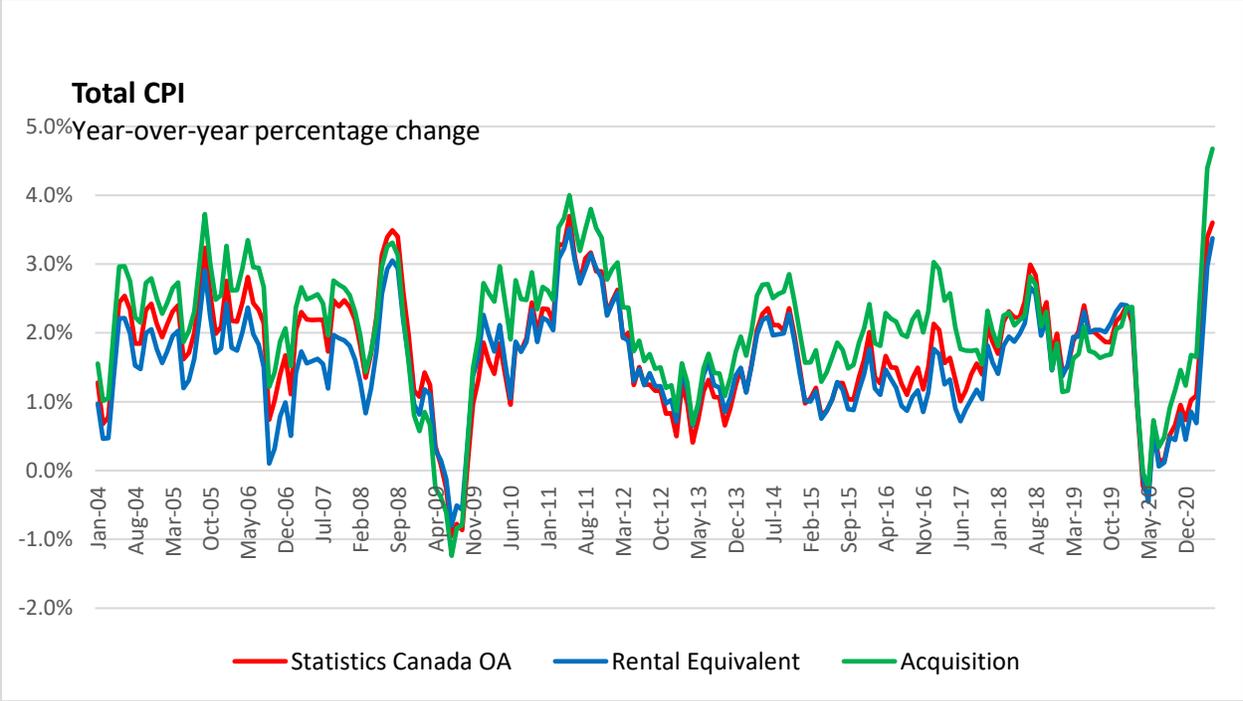


Chart 7: The acquisition approach shows the fastest rate of growth in the All-items CPI inflation



IV. Discussion

There are many uses for the CPI and in principle the main use of the CPI determines its design: It is used by Central Banks to monitor their monetary policy and maintain inflation within a target range. It is also used in official indexation arrangements (e.g. for the up-rating of pensions and tax allowances) and is used as the basis for most wage negotiations in both private and public sectors. Finally it is used as a price deflator in many economic analysis and researches conducted by business analysts and economists.

Ideally, the approach chosen should align with the conceptual basis that best satisfies the principal purpose of the CPI. The methodology of the owned accommodation service in the Canadian CPI is designed to detect the impact of price changes on homeowners’ specific costs. Its purpose is to measure the price-induced changes in the cost of using, instead of buying, a fixed stock of dwellings.

Hence, CPI should not depart drastically from a cost-of-living index (COLI), which is a logical choice for both income escalation and monetary policy purposes. The main advantage of applying a COLI is that it is a welfare-oriented measure and is well suited to the Bank’s mandate to promote the economic and financial welfare for Canadians. However, achieving such target might not be that obvious in practice due to data limitations. Lastly, as a measure of monetary index, a wider gap

with perceptions, excessive volatility or any misleading signals are unfavourable factors that we need to consider.

From a monetary policy perspective, using the criteria of reducing the gap with households' perceptions of inflation, we can clearly see that increased prevalence of house prices in the CPI, which is achieved with the acquisition approach, helps in narrowing the perception-measurement gap. However, by increasing this prevalence it also leads to higher volatility for both owned accommodation and total CPI relative to the official index as well as relative to other approaches such as the rental equivalence (Table 4).

Table 4: Volatility¹⁹ of 12-month change in owned accommodation and all-items CPI over the period 2003-2021

	Statistics Canada's Approach	Payments	Acquisition	Rental equivalence	User cost
OA indexes	1.33	1.47	2.25	0.52	2.01
Total CPI	0.83	0.83	0.90	0.76	0.90

In summary, **the rental equivalence approach** is compatible with the cost of housing, but it can be quite impractical due to availability of data especially when the rental market²⁰ is not well established or thin and market distortions such as rent controls²¹ are significant. This approach does not reduce the gap with households' perceptions of inflation.

The Statistics Canada's approach is relatively consistent with measuring the cost of housing services. Data availability for the components of this approach is also not a major concern, although there are some difficulties pertaining to data related to replacement costs and MICI²². Lastly, this approach does not narrow the gap with households' perceptions of inflation. However, from the statistical agency perspective, the perception gap can be considered as a gauge of the credibility that general public attribute to the official measure. It might also reflect the misconceptions of the public and highlight the need to provide educational support by agencies.

¹⁹ Volatility is defined as the standard deviation of the year-over-year growth rates in the OA indexes and the associated total CPI over the 2003–2021 period.

²⁰ Rent in Canada's major cities is cyclical. Over the past two decades, primary (apartments) and secondary (condominium) rental markets in Canada's major cities is cyclical have become in a number of years tightened as demand outpaced supply. This is partly attributable to the steady population growth, mostly driven by international and interprovincial migration.

²¹ Rent regulation in Canada is set by provincial legislation. With the exception of Montreal, which has strong tenant protections, the other Canada's major cities have weak rent control.

²² For the estimation of replacement cost, there are difficulties related to the estimation of house price index, housing only including both new and existing houses. In addition, data on monthly mortgage outstanding and interest payments are required to estimate the MICI price index.

The acquisition approach has the advantage of narrowing the perception gap and is resting mostly on transaction prices, which is convenient from a practical standpoint. However, this approach does not reflect the cost of housing and tends to generate more volatility.

The payments approach has the advantage of reflecting only actual [transaction] costs and not imputed costs. However, by not accounting for replacement cost it diverges from adequately measuring the cost of housing. It also does not do much in narrowing the gap with households' perceptions of inflation.

Lastly, **the user cost approach** is consistent with the cost of housing. But as we have seen, the imputation of opportunity cost can be challenging, and it also generates an excessively volatile price index series.

In summary, different approaches were reviewed according to different criteria. Overall, approaches that are more consistent with COLI or depart least from a COLI should be preferred, however, the other criteria still matter and need to be taken into consideration depending on the main use of the CPI.

V. Conclusion

The treatment of owned accommodation is one of the most difficult and controversial issues faced by CPI compilers. Statistical agencies usually implement a variant of approaches listed in the [CPI Manual](#). However, there is no best method; each one has its own limits.

Ideally, the approach chosen should align with the conceptual basis that best satisfies the principal purpose of the CPI. The treatment of owned accommodation in the Canadian CPI is designed to detect the impact of price changes on homeowners' specific costs. We attempt to measure the price-induced changes in the cost of using, instead of buying, a fixed stock of dwellings.

More specifically, increased prevalence of house prices in CPI under the acquisition approach leads to higher inflation on average thus narrowing the gap with perceived inflation. However, that approach is not well aligned with the cost of housing concept. Rental equivalence and user cost approaches are more aligned with the cost of owning a house, but the all-item CPI generated with user cost approach is far more volatile than the official index, reflecting the inconsistent impact of expected capital gain price changes on the OA estimates.

The treatment of OA in the Canadian CPI, which is designed to detect the impact of price changes on homeowners' specific costs, represents an acceptable approach that aligns with the conceptual purpose of the CPI. Ongoing discussion with price index practitioners, users, experts and country and international organizations should continue to identify ways to improve the treatment of housing in CPIs.

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